Issued May 9, 1910.

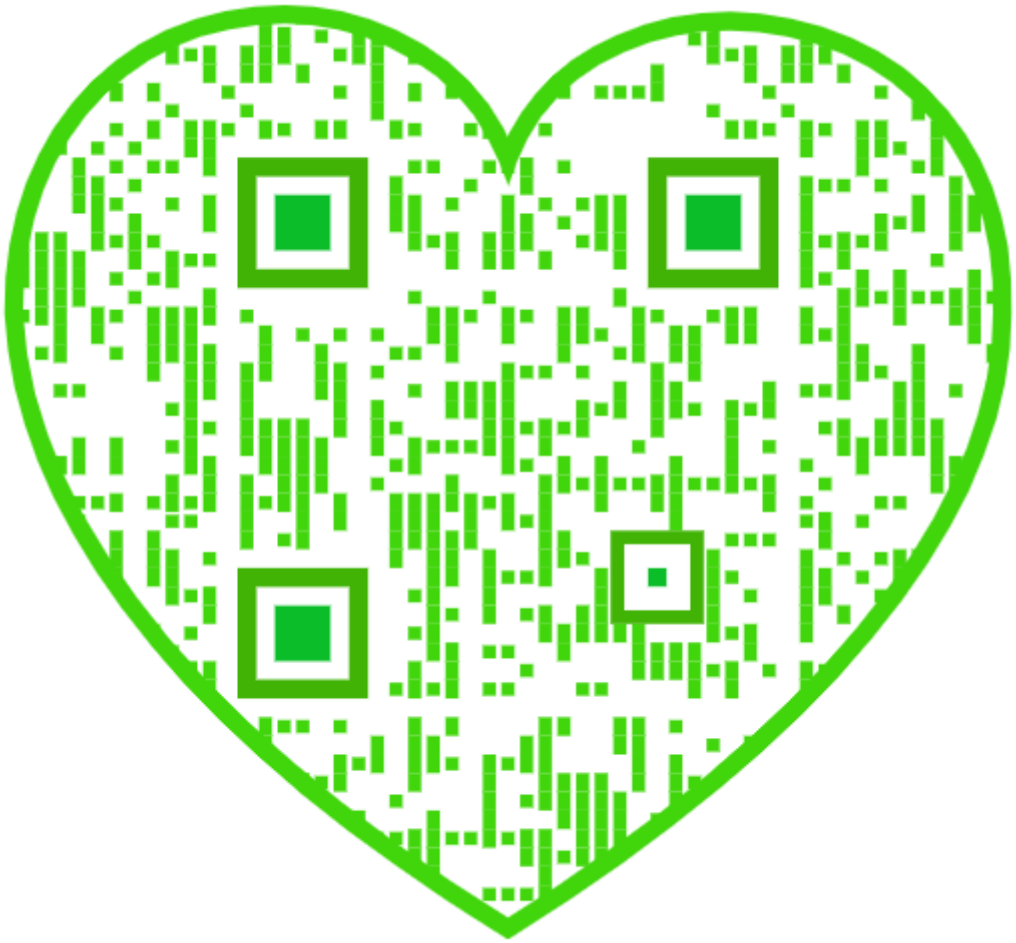
U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS—BULLETIN No. 65.
MILTON WHITNEY, Chief.

FERTILIZERS FOR POTATO SOILS.

BY

MILTON WHITNEY.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1910.



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LETTER OF TRANSMITTAL.

U. S. Department of Agriculture,
Bureau of Soils,
Washington, D. C., September 17, 1909.

Sir: In order to establish certain fundamental principles regarding the effect and efficiency of fertilizers on potato soils, I have had compiled all the available results of plat tests which have been carried out by the experiment stations.

It is believed that this matter will be of considerable interest to the farmers of this country, and I therefore have the honor to recommend that the article be published as Bulletin No. 65 of the Bureau of Soils.

Very respectfully,

Milton Whitney,
Chief of Bureau.

Hon. James Wilson,
Secretary of Agriculture.

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FERTILIZERS FOR POTATO SOILS.

INTRODUCTION.

The experiment stations have recorded in their reports and bulletins the results of 1,769 tests of substances applied to potato soils, or soils upon which potatoes were grown.

Each test represents some single substance used alone or some combination of substances, and every result has been taken when the yield of a check or unfertilized plat has been recorded, when the amount of each substance per acre could be determined, and when the yield or increased yield per acre of potatoes could be found. The results have been accepted, whether the plats were located on the station farm or the experiments were carried out by cooperating farmers. No experiments from any source, not accepted and adopted by the stations and recorded in their official publications, are considered in this bulletin.

NUMBER OF EXPERIMENTS.

The number of tests for each year is given in the following table:

Number of individual tests on potato soils arranged by years.

Year.	Number.	Year.	Number.	Year.	Number.	Year.	Number.
1869	30	1887	54	1895	169	1903	14
1878	9	1888	66	1896	92	1904	25
1881	18	1889	40	1897	107	1905	4
1882	18	1890	150	1898	100	1906	7
1883	33	1891	157	1899	174	1907	28
1884	52	1892	51	1900	106		
1885	33	1893	117	1901	9	Total	1,769
1886	30	1894	46	1902	30		

The following table shows the number of tests from each of the 23 States from which data have been secured:

Number of individual tests on potato soils arranged by States.

State.	Number.	State.	Number.
New York	315	North Carolina	36
Ohio	290	Wisconsin	32
New Jersey	250	Maryland	31
Michigan	152	Illinois	26
Maine	88	Arkansas	26
Indiana	80	Rhode Island	21
Louisiana	75	Massachusetts	16
Connecticut	65	Colorado	13
Texas	63	Alabama	8
Kentucky	60	Minnesota	2
Pennsylvania	43		
Georgia	41	Total	1,769
Tennessee	36		

YIELDS ON CHECK PLATS.

The investigations have been made under a wide range of soil or of climatic conditions, or both, as measured by the yield of the unfertilized or check plats. Unfortunately, owing to the generally inadequate description of the soils in the reports of these experiments, it was found impracticable to group and analyze the data with relation either to physical or chemical differences in the soils; and the grouping employed—natural productiveness, as evidenced by the yields on the unfertilized plats—was chosen as the best available.

The following table gives the individual and average yield of potatoes on the check plats, when more than one such plat has been used and separately rendered:

Yield of potatoes, in bushels per acre, on unfertilized plats when more than one such plat is given.

Yield.	Yield.	Yield.	Yield.	Yield.	Yield.	Yield.	Yield.	Yield.	Yield.
Bushels.	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
6.5	21.6	35.2	22.5	35.4	72.0	87.0	76.0	104.7	122.8
8.1	24.6	42.7	52.0	47.6	88.5	88.0	113.0	110.5	140.3
			60.8	49.5		89.0	114.0	116.2	141.8
7.3	**23.1**	**38.9**	70.0	58.5	**80.2**			118.0	147.8
				67.8		**88.0**	**101.0**	118.7	148.5
			51.3	107.5				119.3	150.5
11.7	16.7	34.4			55.3			122.7	158.0
12.1	20.2	37.7		**61.0**	73.2	89.2	100.8	125.3	164.2
	30.7	53.7			92.8	89.5	100.8		164.7
11.9	33.3				103.7		105.3	**116.9**	165.2
		41.9	42.9	56.0		**89.3**	110.0		166.2
	25.2		43.1	56.1	**81.2**			88.7	181.1
12.3			45.2	67.2		59.5	**104.2**	101.0	
16.9		33.8	48.2	75.6	73.1	71.5		102.2	**154.3**
	5.0	45.0	50.2		89.6	79.0	86.6	114.2	
14.6	27.2	50.0	50.5	**63.7**		91.8	123.3	118.7	
	28.3		52.7		**81.3**	99.6		120.0	
	45.0	**42.9**	54.6	52.8		146.0	**104.9**	121.4	
13.1			54.7	81.6	62.0			121.5	
15.1	**26.4**	33.2	55.7		69.0	**91.2**		122.4	162.0
16.3		34.0	58.5	**67.2**	81.5		96.5	131.7	176.4
	11.8	55.2	59.0		84.0	72.0	101.3	141.5	178.0
14.8	24.7	57.0	62.5	57.0	96.5	79.7	110.3	159.5	178.9
	30.3			77.5	103.5	85.5	112.0	175.7	185.0
12.8	46.2	**44.8**	**52.1**			93.5			198.9
15.2				**67.3**	**82.8**	95.1	**105.0**	**124.5**	204.0
21.5	**28.2**	27.3				99.8		106.0	206.0
21.7		43.1		74.1	39.0	100.8	73.8	106.3	209.1
	31.0	68.9	41.6	78.5	46.2	101.5	98.3	136.3	214.2
17.8	33.5		65.0	80.0	78.2	104.8	104.0	157.7	216.4
	35.3	**46.4**			100.8	112.2	109.6		**193.5**
15.7	35.8		**53.3**	**77.5**	103.0	112.2	110.1	**126.6**	
16.3		38.3			145.4	112.3	122.9		
16.8	**33.9**	49.4		63.3		118.3	123.8	109.0	
23.2		54.6	51.4	65.8	**85.4**			155.0	
	25.8		53.2	71.1		**99.1**			170.0
18.0	28.2	**47.4**	54.9	72.0	73.6		**106.1**	**132.0**	206.7
	54.0		56.9	90.3	73.8	78.0			211.7
17.8		40.2	57.3	92.0	77.9	98.0	93.0	118.7	
18.6	**36.0**	61.2	57.4	96.4	78.5	108.3	127.0	120.2	**196.1**
			57.5		80.7	114.0		133.0	
18.2		**50.7**	58.4	**78.7**	86.6		**110.0**	148.1	
	13.1		58.9		86.7	**99.6**		148.2	
	20.0		64.9		87.7			154.3	
21.5	27.0		68.2	73.3	92.5			161.4	
22.6	45.8	39.5	68.8	77.3	98.5	75.0		163.8	254.6
22.6	51.3	48.6	72.5	85.7	98.5	105.0	108.8	189.5	272.5
23.3	61.0	65.2			103.5	120.0	112.5	199.4	309.5
22.5	**36.5**	**51.1**	**60.0**	**78.8**	**86.5**	**100.0**	**110.6**	**153.7**	**278.9**

It will be seen from this table that the yields of duplicate plats are not all that could be desired for scientific work of this character. No strict or exact quantitative comparison can be made from observed differences between check and fertilizer treatment when duplicate check plats vary, as do some of these, from 12 bushels to 21.7 bushels; 16.7 to 33.3; 5 to 45; 11.8 to 46.2; 13.1 to 61.0; 27.3 to 68.9; 35.4 to 107.5; 55.3 to 103.7; 39 to 145.4; 59.5 to 146.0; 106.0 to 157.7; 88.7 to 175.7; 118.7 to 199.4 This must be borne in mind in interpreting or applying the results in the following tables, and decidedly less weight should be given to the averages based upon the results from a few experiments than to those based upon a great many. In a great majority of cases these tests have been for single years on the same soil or at most for two or three years.

KINDS AND COST OF THE FERTILIZERS USED.

In the 1,769 tests reported there have been used 34 substances and 108 different combinations of these substances, and there have been many different proportions of the several ingredients in the combinations.

In computing, from a commercial standpoint, the relative efficiency of the several substances which have been used in the fertilizer tests, there must be assigned to each some arbitrary value which will represent, as fairly as possible, the average cost to the farmer in the several States. However, when these values for any reason do not represent local market conditions, the data contained in the subsequent tables are sufficient to enable a recalculation to be made on any new basis of value.

The values used in computing the commercial efficiency of fertilizers in this bulletin are given in the following table:

Valuation of fertilizers used in plat experiments on potato soils.

Ingredient.	Cost per ton.	Ingredient.	Cost per ton.
	Dollars.		*Dollars.*
Nitrate of soda	50.00	Dried blood	40.00
Sulphate of ammonia	62.00	Tankage	26.00
Acid phosphate	14.00	Boneblack	22.00
Rock phosphate	9.00	Ground bone	26.00
Floats	8.00	Cotton seed	16.00
Basic slag	12.50	Cotton-seed meal	25.00
Sulphate of potash	60.00	Cotton-seed hulls	4.50
Muriate of potash	44.00	Linseed meal	38.00
Kainit	12.00	Tobacco stems	15.00
Carbonate of potash and magnesia	(a)	Wheat bran	(a)
Sulphate of potash and magnesia	(a)	Chip dirt	(a)
Cotton-seed-hull ashes	34.00	Peat	(a)
Wood ashes	5.00	Guano	50.00
Lime	6.00	Manure	.50
Gypsum	8.00	Hen manure	15.00
Salt	8.00	Compost	.50
Coal ashes	(a)	Commercial fertilizers	20.00

a Not valued.

VALUE ASSIGNED POTATOES.

For the purposes of this comparative study the value to the farmer of potatoes has been taken as 70 cents per bushel, which is approximately the average farm value for 1908 as given by the Bureau of Statistics in the Yearbook of the Department of Agriculture for 1908, page 651.

TABULATION OF RESULTS.

The following table gives a complete summary of the fertilizer tests on potato soils. The actual experiment was usually performed on one-twentieth or one-tenth acre plats, but the results are uniformly stated in pounds per acre for fertilizers and bushels per acre of potatoes, and this unit is retained in this bulletin.

Results of fertilizer tests with potato soils.

MINERALS SINGLY.

Kind of fertilizer used.	Number of experiments.	Increase to no increase.	Range of crop increase.	Fertilizers per acre.		Average crop increase per acre.		Average gain per acre.
				Used.	Cost.			
		Ratio.	*Bushels.*	*Pounds.*	*Dollars.*	*Bushels.*	*Dollars.*	*Dollars.*
Nitrate of soda	55	1.8:1	−68.5 to 64.0	177	4.41	5.5	3.85	− 0.56
Sulphate of ammonia	6	0.5:1	−30.3 to 13.0	330	10.23	− 9.0	− 6.30	−16.53
Acid phosphate	82	4.5:1	−80.4 to 133.9	332	2.32	18.8	13.16	10.84
Rock phosphate	1	0:1	− 14.6	400	1.80	−14.6	−10.22	−12.02
Floats	1	0:1	− 3.4	400	1.60	− 3.4	− 2.38	− 3.98
Sulphate of potash	22	1:1	−58.0 to 92.2	228	6.84	8.0	5.60	− 1.24
Muriate of potash	64	2.8:1	−67.1 to 93.1	187	4.11	16.1	11.27	7.16
Kainit	14	1.8:1	−39.4 to 50.0	539	3.23	3.7	2.59	− .64
Cotton-seed-hull ashes	1	0:1	− 9.5	80	1.36	− 9.5	− 6.65	− 8.01
Wood ashes	16	3:1	−32.5 to 79.8	1,172	2.93	23.2	16.24	13.31
Lime	12	1:1	−31.0 to 49.9	1,966	5.90	2.9	2.03	− 3.87
Gypsum	6	1:1	−80 to 13.6	433	1.73	−10.5	− 7.35	− 9.08
Salt	6	0.5:1	−277 to 10.6	250	1.00	−57.1	−39.97	−40.97
Coal ashes	9	1.2:1	−30.8 to 15.9	14,978	.....	[a] 3.0	[a] 2.10	.....
Total	295	2.04:1	.....	.....	3.82	10.5	7.35	3.53

MIXTURES OF TWO MINERALS.

Nitrate of soda / Acid phosphate	50	5.2:1	−38.4 to 85.0	146 / 289	5.67	29.9	20.93	15.26
Nitrate of soda / Sulphate of potash	5	1.5:1	−26.0 to 63.0	179 / 115	7.92	6.0	4.20	− 3.72
Nitrate of soda / Muriate of potash	55	4.5:1	−78.6 to 144.0	147 / 136	6.66	24.8	16.36	9.70
Nitrate of soda / Kainit	1	1:0	13.4	200 / 400	7.40	13.4	9.38	− 1.98
Nitrate of soda / Lime	2	2:0	23.3 to 25.0	210 / 1,300	9.15	24.1	16.87	7.72
Sulphate of ammonia / Acid phosphate	8	7:1	− 6.8 to 80.2	141 / 333	6.70	38.4	26.88	20.18
Sulphate of ammonia / Sulphate of potash	1	1:0	36.8	300 / 200	15.30	36.8	25.76	10.46
Sulphate of ammonia / Muriate of potash	5	0.25:1	−74.7 to 15.7	220 / 240	12.10	−18.2	−12.74	−24.84
Acid phosphate / Sulphate of potash	14	3.7:1	−12.1 to 106.3	359 / 138	6.65	27.2	19.04	12.39
Acid phosphate / Muriate of potash	85	20.2:1	−12.4 to 149.0	286 / 140	5.08	40.0	28.00	22.92

[a] Not included in the averages, as the value of fertilizers is not given.

Results of fertilizer tests with potato soils—Continued.

MIXTURES OF TWO MINERALS—Continued.

Kind of fertilizer used.	Number of experiments.	Increase to no increase.	Range of crop increase.	Fertilizers per acre. Used.	Fertilizers per acre. Cost.	Average crop increase per acre.		Average gain per acre.
		Ratio.	*Bushels.*	*Pounds.*	*Dollars.*	*Bushels.*	*Dollars.*	*Dollars.*
Acid phosphate Kainit	13	12.0:1	−10.0 to 50.0	380 510	5.72	9.6	6.72	1.00
Acid phosphate Wood ashes	3	3:0	77.8 to 116.4	200 2,000	6.40	94.0	65.80	59.40
Acid phosphate Lime	5	4:1	− 7.5 to 23.7	376 1,460	7.01	11.3	7.91	.90
Rock phosphate Kainit	1	1:0	40.1	500 1,000	8.25	40.1	28.07	19.82
Sulphate of potash Lime	2	2:0	26.7 to 29.3	110 650	5.25	28.0	19.60	14.35
Muriate of potash Lime	1	1:0	51.4	320 2,000	13.04	51.4	35.98	22.94
Muriate of potash Wood ashes	1	0:1	− 44.1	600 625	14.76	−44.1	−30.87	−45.63
Muriate of potash Coal ashes	1	0:1	− 46.8	600 20,000	13.20	−46.8	−32.76	−45.96
Lime Gypsum	1	1:0	13.7	2,000 800	9.20	13.7	9.59	.39
Total	254	6.06:1			6.16	29.6	20.72	14.56

MIXTURE OF THREE OR MORE MINERALS.

Nitrate of soda Acid phosphate Sulphate of potash	13	12:1	−10.0 to 64.0	215 436 153	13.01	36.7	25.69	12.68
Nitrate of soda Acid phosphate Muriate of potash	125	14.6:1	−152.0 to 212.0	223 328 168	11.57	46.8	32.76	21.19
Nitrate of soda Acid phosphate Kainit	4	4:0	23.4 to 109.1	362 350 290	13.24	57.9	40.53	27.29
Nitrate of soda Acid phosphate Carbonate of potash-magnesia.	1	1:0	52.0	250 400 160	.....	[a] 52.0	[a] 36.40	.....
Nitrate of soda Acid phosphate Sulphate of potash-magnesia.	1	1:0	61.0	250 400 160	.....	[a] 61.0	[a] 42.70	.....
Nitrate of soda Acid phosphate Wood ashes	1	1:0	9.0	94 140 2,000	8.33	9.0	6.30	− 2.03
Nitrate of soda Rock phosphate Muriate of potash	2	2:1	71.0 to 149.0	150 1,000 100	10.45	110.0	77.00	66.55
Nitrate of soda Basic slag Muriate of potash	9	9:0	5.4 to 146.0	95 323 100	6.57	45.6	31.92	25.35
Nitrate of soda Muriate of potash Lime	2	2:0	51.3 to 76.0	320 480 2,000	24.56	63.6	44.52	19.96
Sulphate of ammonia Acid phosphate Sulphate of potash	3	3:0	13.1 to 46.1	233 300 250	16.82	24.6	17.22	.40
Sulphate of ammonia Acid phosphate Muriate of potash	53	25.5:1	−15.2 to 121.0	144 297 130	9.40	56.6	39.62	30.22
Sulphate of ammonia Acid phosphate Kainit	1	1:0	128.4	400 300 300	16.30	128.4	89.88	73.58

[a] Not included in the averages, as the value of fertilizers is not given.

Results of fertilizer tests with potato soils—Continued.

MIXTURES OF THREE OR MORE MINERALS—Continued.

Kind of fertilizer used.	Number of experiments.	Increase to no increase.	Range of crop increase.	Fertilizers per acre. Used.	Fertilizers per acre. Cost.	Average crop increase per acre.		Average gain per acre.
		Ratio.	*Bushels.*	*Pounds.*	*Dollars.*	*Bushels.*	*Dollars.*	*Dollars.*
Sulphate of ammonia Rock phosphate Muriate of potash	2	2:0	20.4 to 29.0	175 750 150	12.10	24.7	17.29	5.19
Acid phosphate Sulphate of potash Lime	2	2:0	23.8 to 42.5	260 110 650	7.07	33.1	23.17	16.10
Acid phosphate Muriate of potash Lime	1	1:0	89.4	640 320 2,000	17.52	89.4	62.58	45.06
Wood ashes Gypsum Salt	1	1:0	26.0	150 100 150	1.37	26.0	18.20	16.83
Nitrate of soda Acid phosphate Sulphate of potash Lime	2	1:1	−7.3 to 6.0	200 360 200 2,000	19.52	.7	.49	−19.03
Nitrate of soda Acid phosphate Muriate of potash Lime	1	1:0	108.3	320 640 320 2,000	25.52	108.3	75.81	50.29
Nitrate of soda Acid phosphate Sulphate of potash Wood ashes	2	2:0	2.2 to 29.0	200 360 200 2,000	19.52	15.6	10.92	−8.60
Total	226	17.83:1			10.55	48.5	33.95	23.40

ORGANIC FERTILIZERS SINGLY.

Dried blood	2	2:0	1.6 to 5.1	450	9.00	3.3	2.31	−6.69
Tankage	1	1:0	9.5	1,000	10.00	9.5	6.65	−3.35
Boneblack	3	3:0	25.2 to 76.4	300	3.30	43.5	30.45	27.15
Ground bone	17	4.7:1	−32.4 to 98.7	438	5.69	14.2	9.94	4.25
Cotton seed	6	6.0:0	41.3 to 239.3	3,380	27.04	125.6	87.92	60.88
Cotton-seed meal	23	22.0:1	−16.5 to 202.3	566	7.07	41.2	28.84	21.77
Cotton-seed hulls	1	0:1	−8.3	2,500	5.63	−8.3	−5.81	−11.44
Tobacco stems	3	0:3	−19.1 to −3.6	467	3.50	−8.9	−6.23	−9.73
Chip dirt	4	1:1	−5.6 to 14.8	40.000	.....	[a] 2.2	[a] 1.54	.....
Total	60	5.7:1	.....	.....	8.50	23.7	16.59	8.09

ORGANIC FERTILIZERS WITH ONE MINERAL.

Dried blood Acid phosphate	3	3:0	5.0 to 45.9	200 367	6.57	34.0	23.80	17.23
Dried blood Kainit	1	1:0	22.4	300 300	7.80	22.4	15.68	7.88
Boneblack Nitrate of soda	1	0:1	−43.7	300 460	14.80	−43.7	−30.59	−45.39
Boneblack Sulphate of ammonia	1	1:0	18.3	200 200	8.40	18.3	12.81	4.41
Boneblack Sulphate of potash	21	9.5:1	−16.5 to 88.0	334 170	8.77	35.8	25.06	16.29
Boneblack Muriate of potash	23	22:1	−10.8 to 102.9	332 170	7.39	42.0	29.40	22.01
Boneblack Kainit	12	12:0	13.0 to 65.0	320 640	7.36	29.6	20.72	13.36
Boneblack Cotton-seed hulls	1	1:0	42.8	300 2,500	8.93	42.8	29.96	21.03
Ground bone Nitrate of soda	2	1:1	−16.0 to 73.0	395 130	8.38	28.5	19.95	3.18
Ground bone Sulphate of ammonia	1	1:0	15.3	200 200	8.80	15.3	10.71	1.91

[a] Not included in the averages, as the value of fertilizers is not given.

Results of fertilizer tests with potato soils—Continued.

ORGANIC FERTILIZERS WITH ONE MINERAL—Continued.

Kind of fertilizer used.	Number of experiments.	Increase to no increase.	Range of crop increase.	Fertilizers per acre. Used.	Fertilizers per acre. Cost.	Average crop increase per acre.		Average gain per acre.
		Ratio.	*Bushels.*	*Pounds.*	*Dollars.*	*Bushels.*	*Dollars.*	*Dollars.*
Ground bone Sulphate of potash	11	11:0	14.0 to 120.5	370 215	11.26	68.1	47.67	36.41
Ground bone Muriate of potash	2	2:0	56.0 to 75.0	420 260	11.18	65.5	45.85	34.67
Ground bone Wood ashes	1	1:0	36.0	320 1,400	7.66	36.0	25.20	17.54
Cotton seed Acid phosphate	6	6:0	51.1 to 263.9	3,380 338	29.41	151.7	106.19	76.78
Cotton seed Kainit	6	6:0	41.1 to 206.5	3,380 225	28.39	122.2	85.54	57.15
Cotton-seed meal Cotton-seed hulls	2	2:0	31.4 to 34.0	460 2,500	10.63	32.7	22.89	12.26
Cotton-seed meal Acid phosphate	14	13:1	— 5.0 to 258.8	609 361	10.14	58.5	40.95	30.81
Cotton-seed meal Sulphate of potash	3	2:1	—20.2 to 55.7	787 100	12.84	15.8	11.06	— 1.78
Cotton-seed meal Muriate of potash	4	4:0	12.1 to 23.5	425 155	8.72	15.4	10.78	2.06
Cotton-seed meal Kainit	8	8:0	5.0 to 113.0	493 332	8.15	40.8	28.56	20.41
Cotton-seed meal Cotton-seed-hull ashes	1	0:1	— 9.3	200 80	3.86	— 9.3	— 6.51	—10.37
Cotton-seed meal Lime	2	2:0	27.2 to 38.9	500 600	8.05	33.0	23.10	15.05
Linseed meal Acid phosphate	1	1:0	37.4	250 120	5.59	37.4	26.18	20.59
Wheat bran Acid phosphate	1	1:0	34.0	500 80	.....	[a] 34.0	[a] 23.80	.....
Total	128	15:1	.....	.....	10.68	49.3	34.51	23.83

ORGANIC FERTILIZERS WITH TWO OR MORE MINERALS.

Dried blood Nitrate of soda Acid phosphate	2	1:1	—10.9 to 48.0	75 75 400	6.17	18.5	12.95	6.78
Dried blood Acid phosphate Muriate of potash	25	7.3:1	— 4.9 to 110.7	340 256 167	12.27	45.2	31.64	19.37
Dried blood Acid phosphate Kainit	1	1:0	40.0	300 300 300	9.90	40.0	28.00	18.10
Dried blood Boneblack Sulphate of potash	6	6:0	85.8 to 130.8	280 320 160	13.92	110.3	77.21	63.29
Dried blood Boneblack Muriate of potash	6	6:0	61.1 to 130.0	280 320 160	12.64	104.0	72.80	60.16
Dried blood Boneblack Kainit	6	6:0	26.4 to 81.0	280 320 640	12.96	60.3	42.21	29.25
Dried blood Ground bone Wood ashes	2	1:1	—30.7 to 4.3	2,000 600 4,000	57.80	—13.2	— 9.24	—67.04
Tankage Acid phosphate Muriate of potash	1	0:1	— 2.6	100 100 10	1.92	— 2.6	— 1.82	— 3.74
Boneblack Nitrate of soda Sulphate of potash	40	7:1	—42.0 to 222.0	350 224 181	14.88	50.1	35.07	20.19
Boneblack Nitrate of soda Muriate of potash	43	7.6:1	—18.7 to 134.7	345 216 180	13.15	44.5	31.15	18.00

[a] Not included in the averages, as the value of fertilizers is not given.

Results of fertilizer tests with potato soils—Continued.

ORGANIC FERTILIZERS WITH TWO OR MORE MINERALS—Continued.

Kind of fertilizer used.	Number of experiments.	Increase to no increase.	Range of crop increase.	Fertilizers per acre.		Average crop increase per acre.		Average gain per acre.
				Used.	Cost.			
		Ratio.	*Bushels.*	*Pounds.*	*Dollars.*	*Bushels.*	*Dollars.*	*Dollars.*
Boneblack Nitrate of soda Kainit	16	7:1	−60.0 to 142.6	320 200 640	12.36	36.7	25.69	13.33
Boneblack Sulphate of ammonia Muriate of potash	2	2:0	26.7 to 113.7	200 200 200	12.80	70.2	49.14	36.34
Ground bone Nitrate of soda Sulphate of potash	10	9:1	−16.0 to 75.0	359 218 231	17.05	28.0	19.60	2.55
Ground bone Nitrate of soda Muriate of potash	11	10:1	−15.4 to 79.0	215 122 151	9.18	25.3	17.71	8.53
Ground bone Sulphate of ammonia Sulphate of potash	8	8:0	22.8 to 120.8	400 160 240	17.36	64.5	45.15	27.79
Ground bone Sulphate of ammonia Muriate of potash	10	10:0	24.3 to 92.1	390 168 232	15.38	55.4	38.78	23.40
Ground bone Sulphate of potash Gypsum	1	1:0	72.7	400 400 400	18.80	72.7	50.89	32.09
Cotton seed Acid phosphate Kainit	6	6:0	42.9 to 261.1	3.380 337 225	30.75	129.7	90.79	60.04
Cotton-seed meal Nitrate of soda Sulphate of ammonia	3	3:0	33.7 to 136.0	336 168 112	11.87	68.0	47.60	35.73
Cotton-seed meal Acid phosphate Sulphate of potash	13	12:1	0. to 123.0	668 346 107	13.98	45.6	31.92	17.94
Cotton-seed meal Acid phosphate Muriate of potash	10	10:0	36.3 to 101.9	486 424 168	12.74	67.9	47.57	34.83
Cotton-seed meal Acid phosphate Kainit	13	13:0	5.0 to 206.3	424 292 316	9.24	61.0	42.70	33.46
Cotton-seed meal Acid phosphate Wood ashes	1	1:0	15.0	214 140 2.000	8.65	15.0	10.50	1.85
Cotton-seed meal Rock phosphate Cotton-seed-hull ashes	1	1:0	2.9	200 700 80	7.01	2.9	2.03	−4.98
Linseed meal Acid phosphate Muriate of potash	6	6:0	8.1 to 50.9	250 120 95	7.68	27.7	19.39	11.71
Guano Sulphate of ammonia Muriate of potash	3	3:0	3.7 to 18.3	483 150 100	18.93	10.8	7.56	−11.37
Wheat bran Acid phosphate Muriate of potash	6	6:0	24.9 to 57.0	458 80 85	.....	[a] 37.4	[a] 26.18	.....
Peat Acid phosphate Sulphate of potash	1	1:0	31.5	50,000 200 100	.....	[a] 31.5	[a] 22.05	.....
Peat Rock phosphate Sulphate of potash	1	1:0	35.0	20,000 600 120	.....	[a] 35.0	[a] 24.50	.....
Dried blood Nitrate of soda Acid phosphate Sulphate of potash	2	2:0	4.4 to 59.5	75 75 400 150	10.67	31.9	22.33	11.66
Dried blood Nitrate of soda Acid phosphate Muriate of potash	6	6:0	9.9 to 270.0	420 162 449 171	19.35	142.0	99.40	80.05

[a] Not included in the averages, as the value of fertilizers is not given.

Results of fertilizer tests with potato soils—Continued.

ORGANIC FERTILIZERS WITH TWO OR MORE MINERALS—Continued.

Kind of fertilizer used.	Number of experiments.	Increase to no increase.	Range of crop increase.	Fertilizers per acre.		Average crop increase per acre.		Average gain per acre.
				Used.	Cost.			
		Ratio.	*Bushels.*	*Pounds.*	*Dollars.*	*Bushels.*	*Dollars.*	*Dollars.*
Cotton-seed meal Nitrate of soda Sulphate of ammonia Acid phosphate	3	3:0	55.3 to 144.0	338 169 113 282	13.92	101.5	71.05	57.13
Cotton-seed meal Nitrate of soda Acid phosphate Muriate of potash	2	2:0	59.0 to 67.4	302 75 450 180	12.76	63.2	44.24	31.48
Cotton-seed meal Nitrate of soda Sulphate of ammonia Acid phosphate Kainit	2	2:0	49.7 to 87.3	336 378 210 420 336	25.12	68.5	47.95	22.83
Total	269	11.8:1			14.08	53.5	37.45	23.42

MANURE AND COMBINATIONS.

Manure	81	26:1	−16.0 to 240.3	30,513	7.62	53.1	37.17	29.55
Hen manure	4	3:1	− 9.0 to 48.0	7,000	52.50	22.6	15.82	−36.68
Manure Acid phosphate	5	4:1	− 3.0 to 122.0	14,000 216	5.01	54.7	38.29	33.28
Manure Muriate of potash	1	1:0	225.3	34,128 200	12.93	225.3	157.71	144.78
Manure Kainit	1	0:1	− 26.7	20,000 300	6.80	−26.7	−18.69	−25.49
Manure Wood ashes	1	1:0	55.0	24,000 1,400	9.50	55.0	38.50	29.00
Manure Nitrate of soda Acid phosphate	1	1:0	100.9	20,000 500 300	19.60	100.9	70.63	51.03
Manure Sulphate of ammonia Muriate of potash	1	1:0	171.3	34,128 200 200	19.13	171.3	119.91	100.78
Manure Acid phosphate Sulphate of potash	1	1:0	12.0	4,000 140 50	3.48	12.0	8.40	4.92
Manure Boneblack Sulphate of potash	1	1:0	85.0	24,000 320 160	14.32	85.0	59.50	45.18
Manure Boneblack Nitrate of soda Sulphate of potash	12	12:0	31.3 to 121.0	20,000 160 100 82	11.72	84.4	59.08	47.36
Manure Boneblack Nitrate of soda Muriate of potash	14	13:1	− 5.0 to 144.0	30,000 240 150 120	16.53	43.3	30.31	13.78
Manure Boneblack Sulphate of ammonia Muriate of potash	1	1:0	205.0	34,128 200 200 200	21.33	205.0	143.50	122.17
Manure Cotton-seed meal Acid phosphate Muriate of potash	1	1:0	43.7	400 200 200 50	5.00	43.7	30.59	25.59
Compost	9	1.25:1	−62.2 to 138.0	21,134	5.28	46.9	32.83	27.55
Total	134	11.2:1			10.33	56.6	39.62	29.29

COMMERCIAL FERTILIZERS.

Commercial fertilizers	403	14.5:1	−45.5 to 162.0	1,138	11.38	41.8	29.26	17.88

The following table gives a brief summary or recapitulation of the data presented in the last table, giving, by groups of materials, the number of experiments, the actual number of increases and of no increases reported, the ratio between these, and the average increase per acre in bushels:

Actual number of increases and no increases reported with each class of fertilizer.

Fertilizer.	Number of experiments.	Increase.	No increase.	Ratio.	Average gain per acre.
					Bushels.
Minerals alone	295	198	97	2.04:1	10.5
Mixture of two minerals	254	218	36	6.1:1	29.6
Mixture of three or more minerals	226	214	12	17.8:1	48.5
Organic fertilizers singly	60	51	9	5.7:1	23.7
Organic fertilizers with one mineral	128	120	8	15.0:1	49.3
Organic fertilizers with two or more minerals	269	248	21	11.8:1	53.5
Manure and combinations	134	123	11	11.2:1	56.6
Commercial fertilizers	403	377	26	14.5:1	41.8
Total	1,769	1,550	221	7.0:1	39

EFFECTIVENESS OF SINGLE SUBSTANCES AND MIXTURES.

Notwithstanding what has been said about the wide variations of check plats and the wide variations shown in crop increases with all the fertilizers, the general conclusion that the chances for increased yield and the actual size of the increase are larger with the number of substances used in the mixture, at least up to three substances, seems so consistent and regular that there can be little doubt of correctness.

To examine this point further several of the single fertilizers and their mixtures have been brought together in the following table, showing both the sum of the increases attributable to the single fertilizers and the increases due to their mixtures.

Increase in yield of potatoes due to single fertilizers compared with increase due to mixtures of these fertilizers.

Fertilizer.	Number of experiments.	Increase per acre.
		Bushels.
Nitrate of soda	55	5.5
Acid phosphate	82	18.8
		24.3
Mixture	50	29.9
Nitrate of soda	55	5.5
Muriate of potash	64	16.1
		21.6
Mixture	55	24.8
Acid phosphate	82	18.8
Sulphate of potash	22	8.0
		26.8
Mixture	14	27.2
Acid phosphate	82	18.8
Muriate of potash	64	16.1
		34.9
Mixture	85	40.0
Acid phosphate	82	18.8
Kainit	14	3.7
		22.5
Mixture	13	9.6
Nitrate of soda	55	5.5
Acid phosphate	82	18.8
Sulphate of potash	22	8.0
		32.3
Mixture	13	36.7
Nitrate of soda	55	5.5
Acid phosphate	82	18.8
Muriate of potash	64	16.1
		40.4
Mixture	125	46.8
Sulphate of ammonia	6	−9.0
Acid phosphate	82	18.8
Muriate of potash	64	16.1
		25.9
Mixture	53	56.6
Boneblack	3	43.5
Sulphate of potash	22	8.0
		51.5
Mixture	21	35.8
Boneblack	3	43.5
Muriate of potash	64	16.1
		59.6
Mixture	23	42.0
Boneblack	3	43.5
Kainit	14	3.7
		47.2
Mixture	12	29.6
Ground bone	17	14.2
Sulphate of potash	22	8.0
		22.2
Mixture	11	68.1

Fertilizer.	Number of experiments.	Increase per acre.
		Bushels.
Cotton-seed meal	23	41.2
Acid phosphate	82	18.8
		60.0
Mixture		58.5
Dried blood	2	3.3
Acid phosphate	82	18.8
Muriate of potash	64	16.1
		38.2
Mixture	25	45.2
Boneblack	3	43.5
Nitrate of soda	55	5.5
Sulphate of potash	22	8.0
		57.0
Mixture	40	50.1
Boneblack	3	43.5
Nitrate of soda	55	5.5
Muriate of potash	64	16.1
		65.1
Mixture	43	44.5
Boneblack	3	43.5
Nitrate of soda	55	5.5
Kainit	14	3.7
		52.7
Mixture	16	36.7
Ground bone	17	14.2
Nitrate of soda	55	5.5
Sulphate of potash	22	8.0
		27.7
Mixture	10	28.0
Ground bone	17	14.2
Nitrate of soda	55	5.5
Muriate of potash	64	16.1
		35.8
Mixture	11	25.3
Ground bone	17	14.2
Sulphate of ammonia	6	−9.0
Muriate of potash	64	16.1
		21.3
Mixture	10	55.4
Cotton-seed meal	23	41.2
Acid phosphate	82	18.8
Sulphate of potash	22	8.0
		68.0
Mixture	13	45.6
Cotton-seed meal	23	41.2
Acid phosphate	82	18.8
Muriate of potash	64	16.1
		76.1
Mixture	10	67.9
Cotton-seed meal	23	41.2
Acid phosphate	82	18.8
Kainit	14	3.7
		63.7
Mixture	13	61.0

EFFECT OF USING INCREASED AMOUNTS OF FERTILIZERS.

In the following table are brought together all available data showing the effects of increasing amounts of fertilizers applied to the soil and the corresponding average increase in crop production attributable thereto:

Increase in yield of potatoes attributable to different amounts of fertilizers.

Name of fertilizer.	Quantity per acre.	Number of experiments.	Range of crop increase.	Average increase per acre.
	Pounds.		*Bushels.*	*Bushels.*
Nitrate of soda	Below 100	12	− 1.8 to 43.0	18.5
	100 to 149	9	−68.5 to 37.5	− 7.7
	150 to 199	20	−16.3 to 64.0	11.6
	200 to 299	7	−29.3 to 11.5	− 6.9
	300+	7	−59.4 to 27.0	− 5.0
Acid phosphate	Below 200	16	− 8.5 to 81.5	14.8
	200 to 299	11	−80.4 to 63.5	1.4
	300 to 399	26	−12.3 to 133.9	25.4
	400 to 499	21	− 3.0 to 53.5	19.6
	500+	14	0.8 to 80.8	26.7
Muriate of potash	100 to 149	23	−50.9 to 71.2	8.5
	150 to 199	21	−22.8 to 83.0	27.3
	200 to 299	12	− 9.7 to 93.1	18.3
	300 to 399	4	3.7 to 57.0	33.7
	400+	4	−67.1 to 16.3	−29.5
Cotton-seed meal	Below 300	3	−16.5 to 118.0	37.2
	300 to 499	7	10.0 to 32.7	19.5
	500 to 999	8	7.6 to 52.9	36.1
	1,000 to 1,499	3	33.5 to 119.9	81.7
	1,500+	2	62.3 to 202.3	132.3
Manure	Below 5,000	3	− 0.4 to 89.0	39.5
	5,000 to 9,999	3	41.7 to 59.1	48.0
	10,000 to 19,999	12	8.7 to 169.0	63.6
	20,000 to 39,999	19	−16.0 to 240.3	68.2
	40,000+	44	−13.6 to 127.0	43.0
Commercial fertilizers	Below 300	2	43.1 to 59.8	51.4
	300 to 599	98	−45.5 to 89.5	24.5
	600 to 999	47	−19.5 to 134.6	36.9
	1,000 to 1,499	99	−12.2 to 107.2	39.9
	1,500 to 1,999	75	−13.5 to 151.0	55.2
	2,000+	82	−14.4 to 162.0	56.6

RELATION OF FERTILIZER EFFECT AND NATURAL PRODUCTIVENESS OF THE SOIL.

In the following table are rearranged all available data to show the effectiveness of fertilizers on soils of different productivity as measured by the yield of the unfertilized plats:

Increase in yield of potatoes attributable to fertilizers, arranged in accordance with the actual yield of the "check" plats.

Fertilizer.	Yield of unfertilized plats.	Number of experiments.	Range of increase.	Average increase.
	Bushels.		*Bushels.*	*Bushels.*
Nitrate of soda	10.0 to 19.9	4	1.5 to 30.8	10.3
	20.0 to 29.9	4	− 2.5 to 23.6	11.8
	30.0 to 39.9	6	−18.7 to 14.0	0.2
	40.0 to 49.9	3	− 5.1 to 17.6	5.0
	50.0 to 59.9	6	−22.4 to 42.9	3.8
	60.0 to 69.9	8	−16.3 to 27.0	5.2
	70.0 to 79.9	5	−10.9 to 64.0	16.0
	80.0 to 89.9	7	−29.3 to 41.3	2.5
	90.0 to 99.9	2	−22.0 to 9.6	− 6.2
	100.0 to 119.9	5	−16.0 to 37.5	15.4
	120.0 to 139.9	1	18.8	18.8
	140.0 to 149.9	0	.....	.....
	150.0+	5	−68.5 to 42.3	−10.8
Acid phosphate	10.0 to 19.9	6	1.0 to 20.3	8.3
	20.0 to 29.9	11	0.4 to 53.5	17.0
	30.0 to 39.9	6	− 6.8 to 23.0	5.9
	40.0 to 49.9	3	0.9 to 8.3	5.2
	50.0 to 59.9	8	−17.7 to 33.5	3.4
	60.0 to 69.9	7	−21.7 to 43.4	14.6
	70.0 to 79.9	8	− 3.0 to 80.8	29.8
	80.0 to 89.9	10	−12.3 to 110.8	24.7
	90.0 to 99.9	2	− 5.8 to 3.8	− 1.0
	100.0 to 119.9	10	−14.2 to 112.3	29.0
	120.0 to 139.9	1	81.5	81.5
	140.0 to 149.9	2	5.4 to 88.0	46.7
	150.0+	9	−80.4 to 133.9	20.4
Muriate of potash	10.0 to 19.9	4	− 2.8 to 11.8	3.9
	20.0 to 29.9	5	3.7 to 46.2	17.0
	30.0 to 39.9	6	− 9.5 to 47.3	26.0
	40.0 to 49.9	3	1.4 to 44.1	28.6
	50.0 to 59.9	6	−16.0 to 71.2	11.0
	60.0 to 69.9	7	− 9.7 to 57.0	13.7
	70.0 to 79.9	4	− 0.9 to 66.7	28.3
	80.0 to 89.9	8	− 1.9 to 83.0	24.0
	90.0 to 99.9	2	− 0.8 to −0.3	− 0.6
	100.0 to 119.9	8	− 7.8 to 46.1	14.4
	120.0 to 139.9	1	41.2	41.2
	140.0 to 149.9	1	42.9	42.9
	150.0+	10	−67.1 to 93.1	− 3.3
Nitrate of soda and acid phosphate	10.0 to 19.9	5	− 1.2 to 28.4	12.0
	20.0 to 29.9	4	− 0.9 to 70.9	27.2
	30.0 to 39.9	6	− 0.4 to 49.6	28.4
	40.0 to 49.9	3	3.0 to 16.4	9.8
	50.0 to 59.9	6	− 8.7 to 24.5	19.7
	60.0 to 69.9	5	− 6.4 to 85.0	33.1
	70.0 to 79.9	4	7.3 to 68.3	41.2
	80.0 to 89.9	4	22.0 to 63.2	34.9
	90.0 to 99.9	1	29.2	29.2
	100.0 to 119.9	5	15.7 to 79.2	43.3
	120.0 to 139.9	1	47.5	47.5
	140.0 to 149.9	0	.....	.....
	150.0+	6	−38.4 to 78.0	39.0
Nitrate of soda and muriate of potash	10.0 to 19.9	3	− 6.0 to 16.4	4.6
	20.0 to 29.9	3	0.4 to 50.2	23.0
	30.0 to 39.9	4	−25.7 to 59.4	19.2
	40.0 to 49.9	3	5.9 to 79.9	47.1
	50.0 to 59.9	9	− 8.7 to 41.6	15.7
	60.0 to 69.9	4	− 6.3 to 81.0	26.1
	70.0 to 79.9	4	− 2.5 to 65.2	29.0
	80.0 to 89.9	7	17.9 to 72.0	32.8
	90.0 to 99.9	1	23.2	23.2
	100.0 to 119.9	5	23.1 to 72.0	43.9
	120.0 to 139.9	3	17.9 to 144.0	95.0
	140.0 to 149.9	0	.....	.....
	150.0+	6	−78.6 to 38.4	−20.2

Increase in yield of potatoes attributable to fertilizers, arranged in accordance with the actual yield of the "check" plats—Continued.

Fertilizer.	Yield of unfertilized plats.	Number of experiments.	Range of increase.	Average increase.
	Bushels.		*Bushels.*	*Bushels.*
Acid phosphate and muriate of potash	10.0 to 19.9	9	2.0 to 112.4	31.2
	20.0 to 29.9	6	5.3 to 64.6	21.3
	30.0 to 39.9	9	− 4.3 to 75.4	29.1
	40.0 to 49.9	3	0.2 to 61.4	37.9
	50.0 to 59.9	12	−12.4 to 27.9	19.3
	60.0 to 69.9	6	29.9 to 149.0	80.2
	70.0 to 79.9	5	4.0 to 77.3	40.3
	80.0 to 89.9	13	14.1 to 134.7	53.1
	90.0 to 99.9	4	11.1 to 75.0	39.3
	100.0 to 119.9	12	15.4 to 94.0	57.3
	120.0 to 139.9	3	37.7 to 88.0	65.9
	140.0 to 149.9	0	.....	.....
	150.0+	4	0.8 to 37.7	17.5
Nitrate of soda, acid phosphate, and muriate of potash	10.0 to 19.9	9	− 0.3 to 74.0	48.1
	20.0 to 29.9	3	6.4 to 100.2	41.6
	30.0 to 39.9	17	14.4 to 92.0	63.2
	40.0 to 49.9	3	11.5 to 83.9	59.1
	50.0 to 59.9	18	−10.7 to 75.6	27.8
	60.0 to 69.9	11	13.2 to 160.0	59.5
	70.0 to 79.9	7	− 3.2 to 86.6	30.1
	80.0 to 89.9	9	10.6 to 171.0	48.5
	90.0 to 99.9	7	23.2 to 157.0	88.8
	100.0 to 119.9	10	−15.2 to 109.0	51.3
	120.0 to 139.9	10	14.2 to 212.0	92.9
	140.0 to 149.9	1	54.7	54.7
	150.0+	18	−32.9 to 75.0	35.6
Sulphate of ammonia, acid phosphate, and muriate of potash	10.0 to 19.9	5	28.5 to 118.8	81.1
	20.0 to 29.9	5	20.4 to 38.7	31.4
	30.0 to 39.9	9	1.1 to 105.0	28.4
	40.0 to 49.9	0	.....	.....
	50.0 to 59.9	3	31.5 to 41.7	35.7
	60.0 to 69.9	2	22.5 to 54.3	38.4
	70.0 to 79.9	0	.....	.....
	80.0 to 89.9	5	40.4 to 95.7	62.7
	90.0 to 99.9	5	25.2 to 121.0	80.3
	100.0 to 119.9	10	22.1 to 110.1	71.5
	120.0 to 139.9	4	39.5 to 105.0	81.6
	140.0 to 149.9	5	31.0 to 71.0	59.4
	150.0+	2	−15.2 to− 3.8	− 9.5
Boneblack, nitrate of soda, and muriate of potash	10.0 to 19.9	0	.....	.....
	20.0 to 29.9	0	.....	.....
	30.0 to 39.9	3	45.0 to 164.7	119.3
	40.0 to 49.9	4	12.2 to 16.7	14.8
	50.0 to 59.9	5	62.0 to 141.0	88.3
	60.0 to 69.9	3	10.0 to 71.2	46.0
	70.0 to 79.9	10	−10.5 to 101.2	38.7
	80.0 to 89.9	7	−18.7 to 65.0	28.5
	90.0 to 99.9	0	.....	.....
	100.0 to 119.9	0	.....	.....
	120.0 to 139.9	3	16.1 to 35.1	26.7
	140.0 to 149.9	4	47.1 to 48.6	47.8
	150.0+	4	1.3 to 26.0	13.6
Manure	10.0 to 19.9	4	11.0 to 72.1	40.2
	20.0 to 29.9	4	12.4 to 43.3	31.9
	30.0 to 39.9	7	34.5 to 240.3	100.7
	40.0 to 49.9	4	1.6 to 77.6	24.0
	50.0 to 59.9	7	23.0 to 127.0	79.5
	60.0 to 69.9	7	20.6 to 109.5	59.9
	70.0 to 79.9	9	5.7 to 70.3	43.0
	80.0 to 89.9	12	− 0.4 to 162.0	62.5
	90.0 to 99.9	4	2.6 to 169.0	88.7
	100.0 to 119.9	8	−16.0 to 88.0	34.1
	120.0 to 139.9	3	9.3 to 17.6	12.3
	140.0 to 149.9	7	−13.6 to 91.0	22.1
	150.0+	10	− 9.0 to 61.5	33.8
Commercial fertilizers	10.0 to 19.9	36	− 0.2 to 79.5	25.2
	20.0 to 29.9	51	− 2.2 to 62.8	27.0
	30.0 to 39.9	1	67.0	67.0
	40.0 to 49.9	22	− 5.5 to 131.0	41.7
	50.0 to 59.9	25	−13.5 to 41.7	12.8
	60.0 to 69.9	9	34.1 to 142.9	59.7
	70.0 to 79.9	28	−17.8 to 162.0	71.7
	80.0 to 89.9	51	−19.5 to 136.0	51.3
	90.0 to 99.9	35	−14.4 to 90.2	33.4
	100.0 to 119.9	59	−39.5 to 89.7	40.5
	120.0 to 139.9	36	2.9 to 90.8	50.9
	140.0 to 149.9	1	26.0	26.0
	150.0+	59	−45.5 to 119.7	47.4

SUMMARY.

It appears from the published records that in twenty-three States the experiment stations have made 1,769 tests of substances applied to all sorts of soils.

The variations of yield on unfertilized check plats in the same field and the variation of the increases attributable to fertilizers on different soils and in different seasons are large, nevertheless it appears:

(1) That the chances to obtain an increase in crop and the actual increase in bushels are larger with two or three substances mixed than with single substances.

(2) There is little indication of any significant difference in productivity due to different amounts of fertilizers used.

(3) There is little indication of any significant difference in effectiveness of fertilizers on soils of different natural productivity as measured by the yield of check plats, such differences as are shown indicating a somewhat greater efficiency of some of the fertilizers on the more productive soils.

The data contained in the station reports does not permit one to judge of the cumulative effect of the continued use of fertilizers on the same soil for a long series of years.

It appears that in general the results indicate a very profitable use of fertilizers in the growing of potatoes.

As these results have been obtained from a large number of soils, with a considerable range of productivity, over a number of years, these general conclusions, besides others of a qualitative value which can be drawn from the tables, can, in the absence of any more specific knowledge of any particular soil, be safely followed as a guide to the immediate selection of fertilizers for a potato soil.

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